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ABSTRACT

Both the process and the antecedents of transfer (transfer of skill or knowledge from prior experiences to new ones) are considered by the authors, who suggest ways that teaching for transfer can be implemented. Three questions relating to transfer are considered: Is the capacity or ability to transfer attended to and developed in education and training programs? Can an individual's ability to transfer be developed and/or strengthened through planned learning experiences? and How do you teach for transfer? In an informal survey of forty teachers, the authors discovered that with the exception of adult education, teachers do not teach for transfer, but rather teach knowledge and skills which they assume the student will be able to transfer. The authors argue that while the aforementioned is important, an essential purpose of education should be to teach for the maximum positive transfer of knowledge and skill information. They indicate that the ability to transfer such learning can be taught, but many educators seem to take the learning process for granted, assuming that the ability to apply previous learnings follows from in-class mastery. Providing practice beyond classroom mastery to application in varying contexts under differing conditions is stressed. (Sixteen practical suggestions for teaching for transfer, presented under awareness, sequencing, practice, and reinforcement are included.) (MBK)

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Information Series No. 141

TEACHING FOR TRANSFER: A PERSPECTIVE

by

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and

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1978

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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U.S. DEPARTMENT OF
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FOREWORD

The National Center for Research in Vocational Education is continuing its programmatic research and development of occupational adaptability and transferable skills. This report is one of a series of reports that has been developed to aid researchers and educators in preparing today's youth and adults for careers that will be characterized by change.

Available evidence indicates that many people in the American labor force change jobs, and some do so frequently. Individuals involved in changing from one job to another or from one occupational field to another encounter performance situations requiring the application of previously developed skills and knowledge in new and different ways. An individual's capacity for adapting to job changes and transferring prior skills, knowledge, abilities and attitudes to new applications can have significant impact on their initial success in a new job.

The need to transfer skills and knowledge from one performance situation to another is also encountered by youth leaving school and entering the labor force. Adults during initial entry or subsequent reentry in the labor force also experience the need to transfer and adapt former behavior to new situational demands.

Is the capacity or ability to transfer attended to and developed in education and training programs? Can an individual's ability to transfer be developed and/or strengthened through planned learning experiences? How do you teach for transfer? This paper explores these questions and presents a perspective on teaching for transfer. Both the process and conditions of transfer are considered in suggesting ways that teaching for transfer can be implemented.

The National Center wishes to express its appreciation to the teachers and counselors from the greater Phoenix, Arizona area, including Randy Eubank, Helga Gerber, Greg Gift, Nancy Graham, Darlene Haring, Dale Hudson, Don Lowhead, Dave Muehlbauer, and Alice William for reviewing the initial draft of the paper and providing many valuable suggestions. The helpful advice of Bob Stump, project officer from the National Institute of Education, is acknowledged. In addition, the invaluable aid of Dirk Jolink in data gathering and Connie Faddis in editing is also acknowledged.

The report was prepared under the general oversight of Dr. Frank C. Pratzner, program director of the National Center's study of occupationally transferable skills.

Robert E. Taylor
Executive Director
The National Center for Research in
Vocational Education

TABLE OF CONTENTS

	Page
FOREWORD	iii
INTRODUCTION	1
PART I: TRANSFER SITUATIONS	3
A Hypothesis	5
PART II: THEORETICAL BACKGROUND	9
Transfer as Defined by Learning Theory	9
PART III: PRACTICAL APPLICATION	13
Practical Suggestions	14
PART IV: IMPLICATIONS AND COMMENTS	18
REFERENCES	19

INTRODUCTION

A major trend of education in this decade has been an emphasis on the meaningfulness and usefulness of learning. Parents are concerned with "why Johnny can't read" and employers with why he doesn't have adequate basic life and employment coping skills. Legislators are setting standards for minimum competencies for high school graduation. Schools are being challenged to produce students who are prepared for the world of work.

Parallel with this educational trend is a major one in the labor force: Workers are changing jobs. In the trend towards meaningfulness, and perhaps more satisfying or better-paying jobs, workers change jobs between related areas and across occupational fields. Furthermore, according to articles in recent issues of *Psychology Today* and *The Futurist*, job values are changing. Many male and female workers have traded traditional roles. Some workers have changed careers to go back to more basic lifestyles. Community colleges are proliferating across the nation; life-long learning is becoming a way of life.

That work is of prime importance is seen by the fact that most of us want to work and expect to work. We usually even introduce ourselves by stating what we do.

Most young persons leave school and enter the adult work world. Surveys by the National Assessment of Educational Progress of the Education Commission of the States, and research studies such as those conducted by Northcutt, et al., at the University of Texas, indicate that significantly large percentages of these persons are, for general purposes, functionally incompetent. Not only are they unable, for example, to read a loan agreement or understand their civil rights, they are also unable to get and keep a job.

In a recent study by DeFleur and Menke (1975), the concern was with students' knowledge of occupationally related information. Students in 22 Washington schools were assessed. The researchers concluded that "schools focus primarily on general education matters and have done little in the way of imparting occupational awareness."

Education should prepare students for work or, borrowing from Marshall McLuhan, for "learning a living." Acquiring knowledge and skills is an important part of the educational process. It is also equally important that students learn to use and apply the knowledge and skills they have spent all those years learning. Teaching must develop students' ability and confidence to transfer school learning to life applications. The capacity to transfer may be the most powerful one a person can possess.

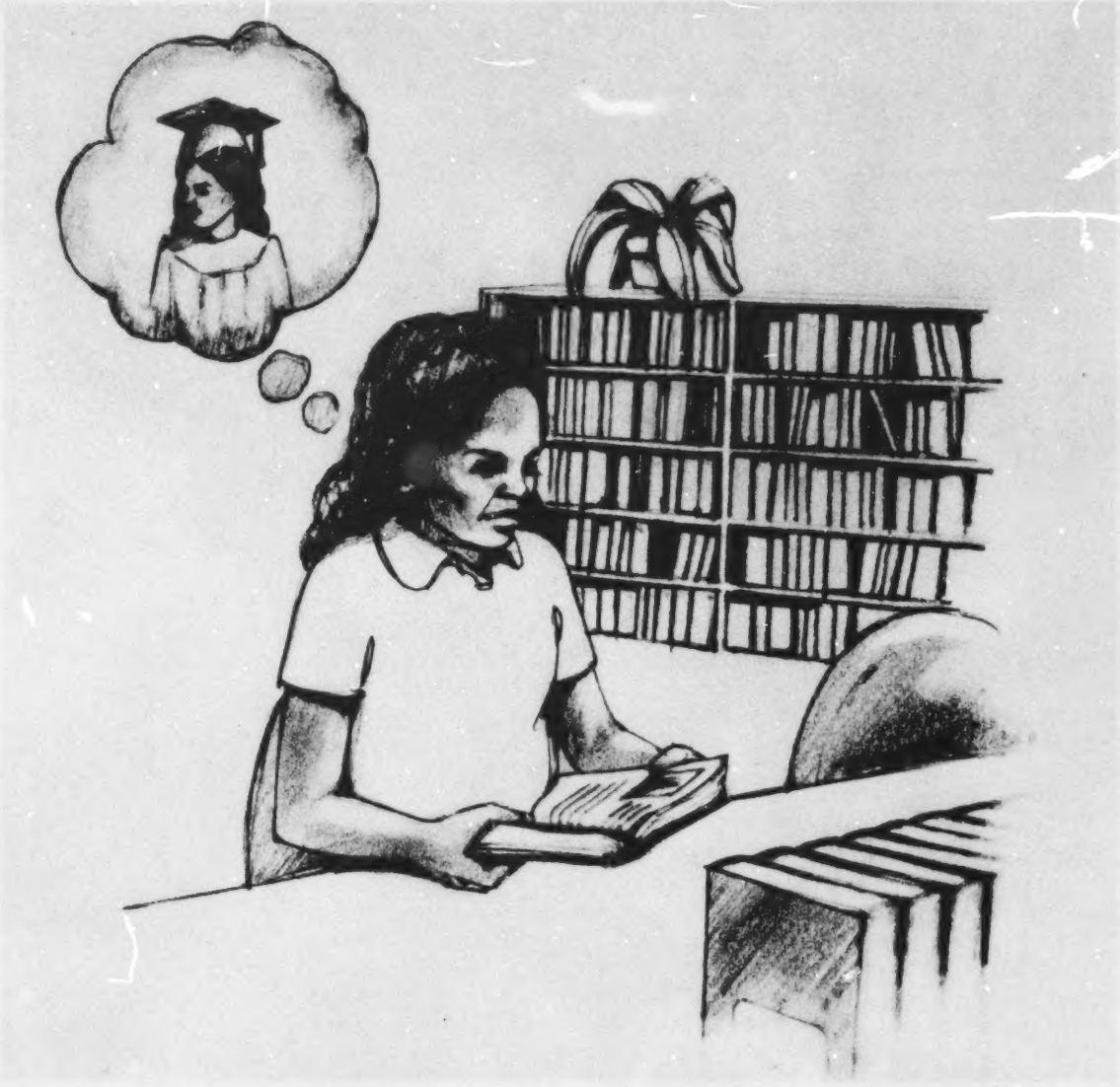
But do we teach for transfer? Do we teach students how to apply their learning when encountering life performance situations? Do we teach them to recognize essential cues so they know they can use a skill already mastered in a different context? Do we teach knowledge and skills that are transferable, but stop short of teaching how to transfer?

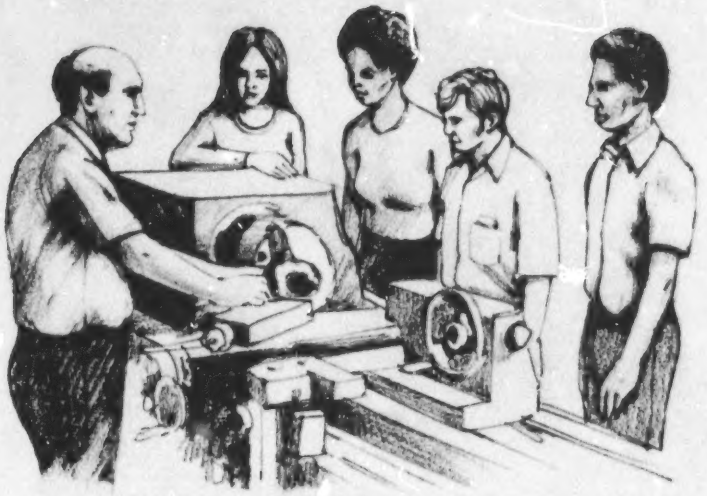
We expect learning to affect future behavior. We expect learning to be built upon. We expect students to acquire new skills. We expect students to graduate and go to work. But do we take for granted a very important instructional step – that of teaching how to learn, to apply, to use old learning appropriately in a new situation?

This paper is written for practitioners in education and training. It is a *perspective* on teaching for transfer. It is not a review of literature on transfer and it is not a research report. At best it attempts to stimulate new thinking on an old subject; at least, it attempts to offer practical suggestions for use in the classroom.

Two central questions will be explored. What is meant by transfer as a principle of learning? As a corollary, what does teaching for transfer mean? These questions will be investigated and examples given for illustration. The definitions and descriptions are based on general theory and the consensus of thoughts of knowledgeable authors.

Readers are invited to participate. The issue is teaching for transfer. Your reactions to the issue, as well as your suggestions, criticisms, and comments, are invited.





PART I: TRANSFER SITUATIONS

Essentially, to transfer is to apply something—a skill, a component of a task, a bit of knowledge—from prior experiences to new experiences. In definition, transfer is not complicated; use it as a verb in the same way you would speak of transferring something from one place to another.

Looking at transfer from a learning viewpoint, the concept implies, first, that something has been learned. That is, something has been retained in memory and not forgotten. The second implication is that what was learned is transferable. That is, the thing learned is not unique to one and only one learning or performance situation. The third implication is that there are opportunities to apply what was learned elsewhere.

Does transfer really happen out there? Is it some mysterious happening that only a few of us experience or observe? Can we really get a handle on transfer-in-action?

What about the child who says something like "his beard feels like soda pop tastes"? Or, suppose a child encounters grits for the first time and says he wants "that melted ice cream"? Or what if he has visited a farm and has seen turkeys, then goes to a zoo and calls a peacock a turkey?

Take the case of Susan. She learned the math skills of adding and subtracting in school. That is, she did well when the problems were written in neat columns on the chalkboard. But what happens years later, when she has to balance her checkbook?

One can identify examples of possible transfer within the classroom. A child learns to use rhythm sticks and advances to the snare drum. A student, having learned about angles and basic calculation, moves on to the Pythagorean theorem. Another has been taught how to analyze the main idea of a written passage, and applies this skill in writing book reports.

In these latter examples, a student learns a behavior sufficiently so that the learned behavior can be applied in a closely related situation. It is this type of transfer that receives most emphasis in school. Essentially, the student is not only learning what applies in a related situation but also is learning to learn.

Unfortunately, this process occurs in the course of progressing from grade to grade with little focus or direction from teachers. An important distinction to make is that there needs to be direction in transferring from learning to performance. What is to transfer has to go beyond learning to future use and application.

Suppose, for example, you have a class of students training for occupations in various production industries. Your teaching objective involves teaching students how to troubleshoot and pinpoint production problems. The expected outcome of the lesson is that what is being learned in the classroom will someday be applied directly on an actual job. That is, someday the student will have to perform appropriately with little or no new training. The student as a worker will have to troubleshoot production problems regardless of the context.

Transfer beyond classroom mastery to on-the-job performance is a peg upon which we can hang our thinking about a student's transition from school to work. Given current educational movements of "Back to Basics" and "Competency-Based Education," this distinction is extremely important. It is not learning, alone, that counts in the real world—it is successful performance.

Teaching for transfer means providing practice beyond mastery to application in varying contexts and under differing conditions. It is not simply the next step in the sequence or chain of learning. It is the step of applying prior learning to life's performance situations. While it would be impractical to try to provide practice for all conceivable situations, it may be feasible to teach application under enough varying conditions so that the skill of transferring-to-performance is learned.

One more distinction needs to be made in relation to transfer, which is the difference between transfer skills and transferable skills. Transfer skills involve the learner's ability or capacity to carry out successfully the *process* of transferring specific knowledge or skills. What is transferred in the process *are* the transferable skills and knowledge. In this perspective on teaching for transfer, we do not focus on what is transferable. In fact, we take the position that anything learned is transferable. But unless the transfer skills are also learned, you have shot your arrows and missed the target.

A Hypothesis

In a further quest to determine what is known about teaching for transfer, we looked through various educational journals, bulletins, and magazines. Our main concern was finding out whether teachers in the 1970's were consciously teaching for transfer. Seemingly, people either were not writing about teaching for transfer or, if they were, were calling it by a different name. An alternative way to find out was simply to ask some teachers about it.

Another concern was about how workers felt about the usefulness of the things they learned in school. Suppose you just stopped a few people on the street and asked them if they used skills on the job that they learned in school or training. What would they say? So we decided to ask some people on the street.

Neither of these little surveys are true research studies; findings are not to be generalized to teachers or workers as a whole. We simply wanted some guiding information, and the best way to get it seemed to be to ask for it.

Several teachers in the Austin, Texas area were asked whether subjects or concepts introduced to their students were taught to the point of application to similar situations. The question was always phrased in terms of the definition of transfer; the word "transfer" itself was not used. The 40 respondents included public school teachers in grades kindergarten through 12, college professors at the University of Texas at Austin, and teachers of adult basic education.

The responses they gave indicated that, in elementary grades, application of learning was not an issue. Remarks were made to the effect that, "It's hard enough just to teach them to read," or, "I suppose they learn to generalize later." The junior high level teachers who were questioned responded that mastery of concepts was important, but application beyond the context in which mastery occurred was not a part of the lesson plan. One teacher remarked that if she didn't have to spend her time teaching what should already have been learned, teaching how to apply knowledge in other contexts would be a good idea.

High school teachers replied that teaching students to apply what they had learned to similar situations was useful "when there was time to do so." One teacher commented that students who were the easiest to teach were also the ones who could bring previous learning to the topic at hand. The few college professors interviewed thought it was less up to them as teachers than up to the students, on their own, to apply what was taught.

A somewhat different picture emerged from talking to several adult basic education teachers. The general thesis of such programs is that the basics of communication, computation, interpersonal relations, and problem solving are taught in relation to occupational knowledge, consumer economics, citizenship, health, and other applied aspects of day-to-day living. Teaching an adult to read, for example, was done in relation to how he/she might read a rental agreement, employment application, or work order. Subsequent learning was built upon previous learning, and concepts were taught to multiple application.

What are these 40 teachers saying? Well, except for the adult basic education teachers, they apparently do not teach for transfer. They teach transferable knowledge and skills.

Why do the adult education teachers teach for transfer? The most obvious answer is that they are dealing with adults faced with basic survival; those people have to pay rent and buy food now. They have to be able to apply what they learn, because someday-when-they-get-out-of-school-and-grow-up does not exist for them anymore.

In the second information-gathering study, six persons on the street were asked what they had learned in school that they used today, about skills they used on the job, and about life in general. For your information, sketches of the six follow.

The Cowboy. Lean and gray, he has spent most of his life around ranches and rodeos in this Texas area. His father was a rancher. Most of what he learned about ranching he picked up from his dad and by watching and doing. He didn't go to school much—just enough to learn how to read, write, and figure. Figuring was used most often in buying things, making payrolls, fencing land, stocking cattle, and so forth. Thinking back, he thought a good skill for people is the ability to talk to others and to be able to say what was important. When asked if anything in school had helped him, he replied—taking a long pull from his beer—"Not yet."

The Graduate. Still under 30, he follows his interests and takes jobs or courses according to what's happening in his life. For instance, after having been jailed in Mexico, he became interested in the people and language of Mexico and returned to the United States to take a degree in Latin American studies. He has not used the degree to date. When he finished school and needed a job, some friends who were working at the state mental hospital got him a job as a nursing attendant. He now plans to go back to college for a Master's degree in psychology or social work. A skill he uses in situations is the ability to get along with others. He thinks that he picked this up from his mother and from school, and that it's something he will continue to use whatever he does in life.

The Piano Tuner. Her mother played the piano and she herself took lessons as a child. Music was always a keen interest, but more as a hobby than as a way of making a living. She took some journalism courses in college but wasn't very interested in them. Now 26, she went to trade school for a year and graduated as a piano technician. She thinks she will stay with this job for a while.

Before tuning pianos, she worked as a cook, waitress, and bartender in several jobs. Something she learned in school that helped her was general arithmetic, inasmuch as she frequently had to make change and operate the cash register. Another important skill was how to get along well with others because, as she said, "You have to do this if you wait on people or go into their homes to work on a piano."

The Self-Employed Carpenter. In his mid-40's and a bachelor, the skill he uses most is carpentry. He works when jobs are available or when he needs money. He has some hundred hours of college work, mostly in business. He never finished college, mainly because he didn't like the kinds of jobs he could get with a degree in business. He doesn't want a steady job because, "Once you are on someone's payroll, you have to do what they tell you." He likes working with his hands and using tools. He uses basically the same tools on a number of jobs to build fences, houses, tables, chairs, etc.

The only thing he remembers liking in school is shop (woodworking). Working with wood has always been a hobby and he enjoys doing nice work. He has little regard for formal education and thinks that you can learn more from life than from books; reading should be for pleasure. An important skill to know, according to him, is math; it is needed "for building things and for figuring out what you owe."

The Security Police Officer. Petite and with a gun at her hip, she is a security officer in a department store complex. After working as an airline stewardess for an international airline, she got a job as a security person, and, for private industrial firms, acquired a license and obtained national security ranking. She thinks her job is interesting and challenging for a woman. However, her main interest is in art and she hopes to be self-supporting in that field some day.

Her mother was an art teacher and she herself majored in art in college. Naturally charming, she doesn't see getting along with others as a skill, per se, and thinks that what is important to learn in school is how to express yourself; this she is attempting to do in her chosen field of art.

The Accountant. His college course work and most of his jobs have gone hand in hand. A college graduate in business, his main interest is in finance and his jobs have been in bookkeeping and accounting. He is currently working as an accountant in an architectural firm and has taken a few graduate courses in architecture for information and general interest. He was always good at math and developed his interest as a skill to be used in his career. Learning was, for him, a sequential activity from the first grade onward, so what he did in the military service and in college "just followed." He was aware of learning skills that were transferable to job situations, but he doesn't think now that "learning how to learn" was a conscious act or something that was ever stressed in a school setting. Interestingly, he picked up the idea of transfer during the interview, and, afterward was plotting how he might use his skills and knowledge to pursue a career in his main interest area of finance.

What is it the six said? Three things are of immediate interest: the skills they thought important (math, interpersonal relations, communicating), the general lack of an awareness of the relationship between the learning process to life and career, and the fact that what was learned in early childhood affected subsequent behavior.

In general, an original hypothesis was confirmed: There appears to be lack of awareness on the part of both teachers and workers in regard to the concept of transfer. To qualify this, there appears to be a lack of awareness in regard to the 46 persons interviewed. Those of you elsewhere are invited to talk to teachers and workers and come to your own conclusions.

PART II: THEORETICAL BACKGROUND

Transfer as Defined by Learning Theory

The principle of transfer is not new to learning theory. Traditionally, studies of transfer have used white rats for subjects or verbal learning as content. Psychologists, such as Bugelski (1964) and Deese and Hulse (1967), have written on transfer of learning or training with implications for teaching. What does not seem to be available, at least at this point in time, is a systematic look at variables affecting transfer of learning either in terms of teaching methodology or expected student behaviors.

Transfer is a principle of learning. All theories of learning deal with it, so it doesn't matter much which one we pick for description. Since people are probably most familiar with stimulus-response terminology, it will be used for illustration. Consider the case of the gypsy and the dancing bear.

Supposedly, gypsies trained bears to dance by placing them on a surface over a fire. Music was played and as the surface grew hot, the bear shuffled his feet, or "danced." Eventually, the music alone (without the fire) was *stimulus* enough to elicit the desired *response* of dancing.

Suppose, however, that a flute was used to make the music by which the bear was *conditioned* to dance, and that the flute was lost. The gypsy, then, in order to get the desired response, made a flute-like sound using a bamboo reed. And the bear danced. Next, the gypsy made a similar sound (but one further removed from the original flute sound) using paper and a comb. And the bear danced.

Our illustration is an example of the principle of *stimulus generalization,* which can be regarded as one of the basic principles by which transfer operates. You may also recognize the principle of stimulus generalization as classical conditioning—for instance, Pavlov's dogs were conditioned to salivate to a tone paired with electrical shock (the flute and the fire), and the dogs eventually salivated to the original tone alone, and later to a variety of different tones. Stimulus generalization simply means that a cue or stimulus similar to the original learned stimulus or cue will evoke a desired response in a similar situation, given that (a) the desired response was indeed learned previously, and

(b) that the second stimulus (or third, fourth, etc.) is similar enough to the original for transfer to occur. This latter aspect is called the *gradient principle of generalization.* Essentially, it means that the closer the relationship or the more similar something new to be learned is to what was previously learned, the more likely it is that transfer from the first situation to the second will occur readily. The opposite is also true; that is, the more unlike a subsequent learning activity is to the original, the less likely prior knowledge will transfer to the subsequent activity.

Transfer of performance occurs when *identical elements* or components of a task are the same or closely similar to the elements of the new task. Once the original task elements are thoroughly learned, transfer facilitates learning in a subsequent task where the same elements appear. In addition, a basic principle can be learned and this principle, when applicable, can be transferred to future learning; this is *transfer by principle* and is essential in allowing prior learning to cross over to other subject areas or performance tasks. Both transfer by identical elements and transfer by principle occur in similar ways according to the gradient of generalization. The first is demonstrated in chaining or serial learning and the second in such things as using the principles of the "scientific method" for problem analysis and solution in a variety of contexts—scientific, economic, social, etc.

The importance of the process of transfer in a student's ability to acquire new knowledge and skills has been strongly emphasized by various contemporary psychologists working on specifications for instructional materials for effective learning. For instance, Robert Gagne (1970), in his definitive work, *The Conditions of Learning,* talks of a principle he terms "cumulative learning." This is the principle that the learning of any new capability builds upon prior learning. He states emphatically that "unless the learner can recall this prerequisite capability (of building upon prior learning), he cannot learn the tasks." Ausubel (1968) talks of an important principle in instructional development that he terms "subsumption." That is, meaningful learning takes place when a new idea is *subsumed* into a related structure of already existing knowledge. He goes further in his concept of "integrative reconciliation" to say that new ideas, once introduced, need to be related deliberately to old ideas, to have significant similarities and differences pointed out, and to have real or apparent inconsistencies reconciled by the teacher in order for effective student learning to occur. For all practical purposes, this is what we mean by transfer.

Deese and Hulse (1967) state that transfer theory began with very practical educational questions and that "there would be no point to the formal institution of education if there were no such thing as transfer. We assume that a large part, if not most, of what children learn in schools will be useful to them in the great variety of situations they face outside the schoolroom" (p. 347).

Morgan (1956), in his text *Introduction to Psychology,* defines transfer of training (his term, training, is used here synonymously with learning) as "more rapid learning in one situation because of previous learning in another situation (positive transfer, q.u.); or slower learning in one situation because of previous learning in another situation (negative transfer, q.u.)" (p. 646). We use this definition to introduce the concept that transfer is negative, positive, or neutral (where neutral is defined as no transfer).

The essential purpose of instruction is not only to teach knowledge and skills (an acknowledgment to you out there who insist on knowledge for knowledge's sake), but also—and most importantly—to teach for maximum positive transfer. Positive transfer is also connected to the gradient of generalization. What transfers positively from prior learning is that which is most closely related, in identical elements or principles, to the new task to be learned. To maximize positive transfer, however, is to include other conditions of learning, such as immediate feedback and reward, practice to mastery, overlearning, and practice to what is being learned under varied and differing conditions.

Negative transfer inhibits or interferes with learning. Something learned incorrectly or not learned well will result in slower learning, or, in some instances, no learning.

Closely allied with positive and negative transference are factors of attention, retention, and forgetting. What is learned to the point of retention is what transfers. What is to be retained must be considered to be an integral part of the instructional process. Unlearned material/information/skills do not transfer. In transfer of learning, the student must have *learned* necessary knowledge (or steps, procedures, etc.) in order for it to transfer to a new situation. And what is retained can, by definition, affect transfer either positively or negatively. The implication for teaching is awesome: If what is retained and transferred is what is taught, then teachers need to make sure that what is taught is what is to be recalled.

Some things learned are forgotten. However, as Bugelski (1964) points out, "Assuming that forgetting will occur, the basic reason for learning is so that we can relearn. If any fact in psychology is a fact, it is that relearning some forgotten material can be accomplished in a fraction of the original learning time" (p.176). In this instance, cues previously learned transfer positively to facilitate relearning.

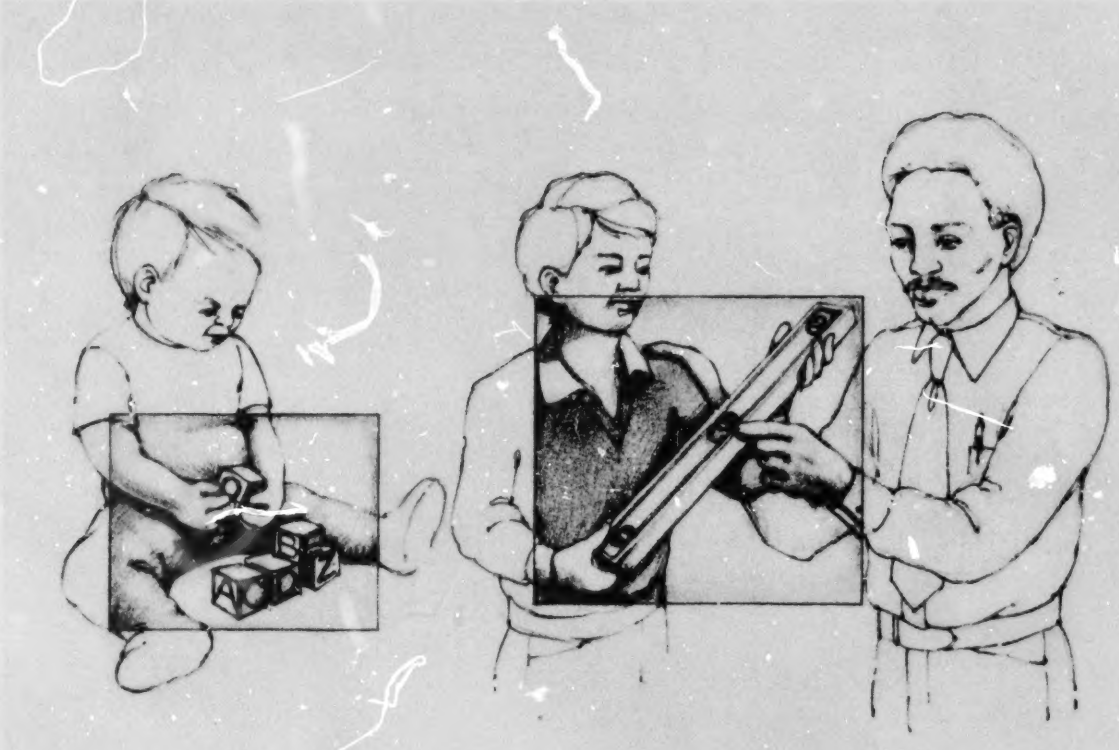
Forgetting, as well as negative transfer, can result in inhibition or interference with the acquisition or application of new skill or knowledge. That is, in both forgetting or negative transfer something interferes with learning or retention. Forgetting, however, is selective; we forget some things, others we don't. Something learned that transfers negatively is tenacious and will be retained until corrected. Unlearning of improper performance or misinformation must occur before new learning can proceed without interference.

What is important to the issue of transfer in this context is that attention, retention, and forgetting affect one's acquisition and use of skills that transfer. It is perhaps easier for teachers to identify and teach a single element or series of elements than it is to identify and teach to the skill or concept that combines or relates these elements. That is, it is probably easier to teach a circle than the concept of roundness, and easier to show how one task differs from another than to teach the skill of discrimination.

Transfer is not only related to conditions of learning but also to learner characteristics. Important learner characteristics are probably related to what we, for convenience, will call awareness and motivation.

Students must be aware that they are learning something that they can apply to different situations. They must also be aware of their potential for growth, and that the knowledge and skills they acquire at an early age can be built upon and expanded. They must also be aware that they can learn to learn. Learning to learn is itself a skill that transfers.

Students must also intend to learn. They must be involved in the learning process and be motivated to use their knowledge. What they use and apply is what is retained for transfer. What is meaningful and real to them is not forgotten. What is used correctly creates a pattern of success that's vital for new skill acquisition. And as their capability for transfer increases with growth and application, students are more likely to evaluate their own learning experiences and thus perpetuate their motivation for successful performance in the world they encounter outside of the classroom.



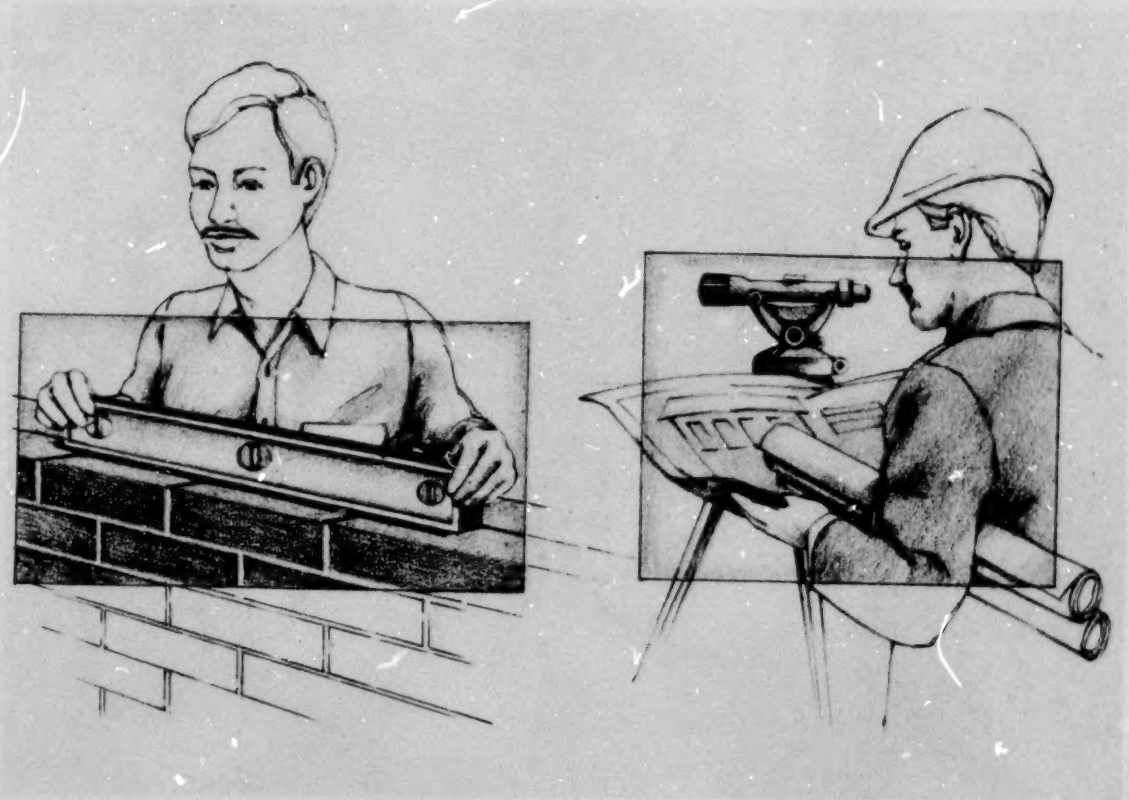
PART III: PRACTICAL APPLICATION

Whether or not teaching for transfer in the classroom is an appropriate use of an applied principle of learning is a debate we would like to open. Our contention is that by stopping short of applicability of prior learning to various new situations, we are neglecting what ought to be an important part of the learning process. We believe that by teaching for transfer, we will better equip students to make the transition from school to work.

The scope of work of this paper did not include a development of a curriculum for teaching for transfer. This may well be a next step in the research process. An alternate to an academic curriculum may well, however, be an adaptive methodology of teaching for performance in the world of work.

Regardless of the future direction of teaching for transfer, the entire burden should not rest with teachers or just the schools. We agree with O'Toole (1977), that:

> By the late 1960's, schools and colleges were broadly charged with the following kinds of social functions: achieving social equality; integrating the races; eliminating sexism; cooling off the expectations of the lower classes; baby-sitting and other custodial activities; warehousing youth to keep them off the labor market; increasing the gross national product through upgrading the work force; training youth for jobs; sorting, certifying, and selecting talent; catching up with the Russians in



science and technology; recruiting and training youth for the military; providing hot lunches, health care, counseling and instruction about sex, drugs, and driving. The schools have not yet, to my knowledge, been used as centers for the eradication of those quintessential American scourges—halitosis, dandruff, and tired blood—but the odds would favor it if present trends were to continue. In short, society has attempted to utilize the schools as levers to correct nearly every evil known to humankind. As a consequence, they have corrected very few. (p. 37)

Nevertheless, reviewers of the initial draft of this paper were in agreement that practical suggestions for teaching for transfer should be offered. To this end, some suggestions have been gleaned from instructional technology and are presented for your consideration and use. These are written for teachers or trainers. If we fall short on the "how to" aspect, it is not for a lack of ideas, but for lack of definitive support from literature and field practices.

Practical Suggestions

For convenience, the discussions that follow are divided into general areas. Premises and suggestions overlap intentionally. The list is neither complete nor definitive. What we offer is a beginning, a start on teaching for transfer.

Awareness. Teaching for transfer invites an open system. Knowledge and concepts that are transferable should be identified and labeled as such. Teaching objectives ought to be specified; students ought to know what they are learning and the relevance of this learning. Learning to

learn ought to occur early in the educational process, and should be encouraged and reinforced throughout the student's growth and development. Specific suggestions include:

1. Identify for students the skills/knowledge that transfer. Do not assume that the students are getting the idea on their own. Provide guidance in the steps of learning a series of related tasks. Point out what is common in the tasks.

2. Teach students how to learn. Provide instruction and practice in a variety of learning approaches and techniques. Students learn differently and some learn better one way than another.

3. Build upon prior learning. Teachers unfamiliar with a student's background and prior learning experiences should evaluate the student prior to providing instruction. Diagnostic tools, school records, counselors' assessments, and interviews with parents and past teachers could be of help.

4. Seek new approaches and techniques that may help students that are having difficulty. Don't assume that they are unable to learn, but rather that they have not yet found the ways that best fit their abilities and characteristics.

5. Involve students in the learning process. Provide opportunities for students to select and use prior learning in new learning situations. Making the material meaningful and relevant to current student interests and needs can motivate the students. Provide intermediate rewards for successful performance when the ultimate application is long-range. Avoiding unnecessary repetition of already mastered material will aid in retaining interest.

6. Teach students to evaluate their own performance and to establish their own standards. Students can be taught to attend to the outcomes of their performance and to use such feedback to improve, change, or acquire new knowledge/skills. This is an important transfer skill in adapting to work situations. Getting the students to pay attention to what and how they are doing it, how they could do it better, and why they are doing it, is a start in teaching self-evaluation of performance. How one gets a student to pay attention is something we are not able to agree upon. We recognize this as a problem. Possible ways are discouraging memorization, using audio-visual techniques, and capitalizing on relevant issues at hand.

Sequencing. Transfer occurs readily when tasks are arranged according to their similarity. New learning tasks closely resembling prior learning tasks are more readily learned. Tasks that contain elements identical to those already known are more easily assimilated than tasks containing unfamiliar elements. Sequences can be based on similarity of concepts, elements, principles, or learning strategies. Knowledge/skills learned to mastery provide a necessary basis for the next related task, and so forth. Suggestions for teaching include:

7. Arrange learning tasks along a gradient of similarity. This may be particularly important in introducing a new series of tasks to be learned. As prerequisites are mastered, the students are more able to transfer prior learning to the task at hand.

8. Avoid unnecessary repetition. Once components of a task are mastered, do not repeat all components in related tasks, but teach to the transfer skill inherent in the task. Focus on improving the skill common to the sequence of material and minimize repetition of learned material to avoid boredom.

9. Specify the teaching objective, the task to be taught, and the instructional style to be used—and stick to it. That is, don't mix your metaphors in sequencing. Introducing opposing views and alternate approaches, or teaching part of the sequence one way and part another, may result in no learning, or negative transfer. Be certain that the critical skills are mastered before proceeding to application under differing conditions.

10. Proceed from the simple to the complex, or from the real to the abstract. Build on the basic and sequence tasks to reinforce a single skill. Likewise, keep increments of transfer small at first, and go to larger ones as the student learns to transfer and handle the material.

Practice. The importance of proper practice cannot be overemphasized. Only the knowledge and skills that are retained in memory can transfer. Complete learning is seldom accomplished in one trial unless it is something awesome like "fire is really hot." Skills that are transferable should be developed to mastery and then practiced for application under new and varying conditions. Once something is learned, adequate practice in transferring is required to insure positive transfer to and application in new situations.

To provide adequate practice does not mean to give more problems to solve, books to read, etc. You have accomplished little, if, instead of doing 10 problems wrong, the student does 15 wrong. Drills should be selected to teach specific skills. Unnecessary repetition of drill in that skill, once it is mastered, should be avoided. Suggestions for teaching include:

11. Teach for mastery. If prerequisite skills and knowledge are not learned, students will lack the basis necessary to acquire new knowledge and skills. Set initial learning standards within the achievement capability of each student. As students succeed, raise the standards to a higher level to encourage continuous improvement.

12. Provide guidance in the practice of transfer. Prompt the student whenever application of prior learning can apply to the task at hand. Correct any misapplication that occurs. Ways for teachers to provide guidance could be through controlled review of mastered material, and careful demonstrations at selected points.

13. Provide practice in transferring. Guide the student in practicing the same skill in a variety of performance situations or in a number of academic disciplines.

Reinforcement. There is no more powerful tool for shaping student behavior than reinforcement. To optimize positive transfer, reinforce correct applications of learning. Reinforcement may be some kind of reward or may come through the success of doing something right. At any rate, whatever serves to strengthen the ability to use prior knowledge in a new situation, or whatever guarantees that the skill learned will transfer, is a reinforcer.

14. Reinforce correct applications of transfer. Provide adequate feedback in students' use of knowledge and skills. This means to reward successful behavior and to correct inappropriate behavior. Keep in mind that immediate reinforcement is usually more effective than delayed reinforcement.

Cues. An important aspect of the ability to transfer successfully involves the ability to recognize the proper cues. Cue recognition must be taught and should be part of the labeling and identifying process talked about under Awareness. The ability to recognize cues is important in associating what is inherent in the new task that will facilitate recall of prior learning. It is also important

in discrimination—that is, determining how something new is different from those things previously learned. Suggestions for teaching cues include:

15. Teach cue recognition for use in transferring to a new application. Cue recognition aids in discriminating between subsequent applications. The ability to recognize cues aids recall, and serves to insure against forgetting. Cue recognition will also aid in relearning of forgotten material.

16. Teach cues in multiperceptual contexts. As application is often appropriate in more than one way and to more than one situation, cues to elicit desired behavior may occur in differing perceptual modes. Providing practice in cue recognition in different modalities will serve to strengthen retention of knowledge and skills for recall and use.

PART IV: IMPLICATIONS AND COMMENTS

Every day, cries are heard from the general public to the effect that education is not doing its thing. Employers in business and industry say that we give them people who cannot read or write and who do not have attitudes conducive to working with others. Perhaps the problem is that the transferable skills sought by employers—for example, the abilities to communicate, compute, interact, and relate—are not all that successfully imparted to students in the school setting. We suggest a simplistic explanation to account for at least part of this failure: There may be nothing wrong with what was taught, except that it was not taught for transfer to future application. Students did not receive adequate practice in learning how to transfer their skills and knowledge to performance.

One expectation of teaching for transfer is to graduate students with skills useful to and usable in the world of work. For other expectations, let us look at where else successful transfer is important.

One area is in new jobs, which are being created by the demands of society and science. Who is initially going to fill the positions? Can we analyze the tasks and identify people with the required transferable skills for adequate job performance? As technology advances and jobs are demolished in its wake, how do we recycle those workers to jobs where they can perform? Also, what do we do about identifying which transferable skills workers have that are prerequisites for new skill acquisition?

Another area involves persons making career decisions. Transfer of what a person knows and can apply should probably be a chief consideration. Counselors who are aware of the principles of transfer and their implications for career choices could provide valuable aid to students making initial career decisions or to workers changing occupations. This would also hold true for employment counselors who are responsible for trying to match the skills of the unemployed to the requirements of available jobs. That is, placement of people could be done on the basis of the skills/knowledge that they have that will transfer to specified job situations.

While these are areas where thinking in terms of transfer is appropriate, bringing transfer to the fore as a frame of reference brings up some issues that need to be researched and decided. There are academic questions, such as what is involved in the process of transfer that could be incorporated into good instructional or training methodologies. There are vocationally-related questions, such as what skills are common to which job clusters, and how can school-based work experiences be taught to transfer to real-life performance. And there are practical considerations: How do you test for transfer? How do you assess mastery of transfer skills necessary for job performance? How does testing for transfer differ from testing for minimal competencies?

Students are encountering difficulties in getting and keeping jobs. Workers who are occupationally mobile are in need of retraining and proper placement in available jobs. What do we know about their abilities to apply learning to new situations? What are the characteristics of an occupationally-mobile person? How can we build on those characteristics to help recycle older workers into new industry?

There are many complex questions and no simple answers. Has the time come to answer some of these questions? Is it viable and practical to develop a technology of teaching for transfer? We believe it is time to look at transfer of training as it can apply to performance in the world of work.

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